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CLAIMS

- 1 1. An optical system comprising:
- 2 a substantially planar substrate; and
- a waveguide channel at least a portion of which is at least partially buried in
- 4 said substrate, said waveguide channel having a portion exhibiting a taper in two
- 5 dimensions.
- 1 2. The optical system of claim 1, wherein said waveguide channel defines an
- 2 optical axis and lacks continuous rotational symmetry about said optical axis.
- 1 3. The optical system of claim 1, wherein said waveguide channel is elongate
- 2 along a light propagation path of said waveguide channel; and
- 3 said substrate is shaped to accommodate an optical component aligned with
- 4 said light propagation path.
- 1 4. The optical system of claim 1, wherein said substrate defines a locating
- 2 contour, said locating contour being adapted to engage an optical component such that
- 3 engagement of the optical component with said locating contour positions the optical
- 4 component for optically communicating with said waveguide channel.





- 1 5. The optical system of claim 1, wherein said waveguide channel is entirely
- 2 buried in said substrate.
- 1 6. The optical system of claim 1, further comprising:
- 2 an input transmission medium optically communicating with said waveguide
- 3 channel, said input transmission medium being configured to propagate light to said
- 4 waveguide channel; and
- 5 an output transmission medium optically communicating with said waveguide
- 6 channel, said output transmission medium being configured to propagate light from
- 7 said waveguide channel.
- 1 7. The optical system of claim 1, wherein said waveguide channel is a first
- 2 waveguide channel; and
- 3 said optical system further comprises:
- 4 a second waveguide channel at least a portion of which is at least partially
- 5 buried in said substrate, said second waveguide channel having a portion exhibiting a
- 6 taper in two dimensions.
- 1 8. The optical system of claim 7, further comprising:
- 2 means for propagating light between said first waveguide channel and said
- 3 second waveguide channel.

- 1 9. The optical system of claim 1, wherein said waveguide channel includes a first
- 2 waveguide channel portion, a second waveguide channel portion and a linking portion
- 3 located along a light propagation path between said first waveguide channel portion
- 4 and said second waveguide channel portion, said linking portion being at least
- 5 partially buried in said substrate, said linking portion being adapted to propagate light
- 6 between said first waveguide channel portion and said second waveguide channel
- 7 portion.
- 1 10. The optical system of claim 9, wherein a trench is formed through at least a
- 2 portion of said linking portion, said trench being adapted to receive an optical
- 3 component.
- 1 11. The optical system of claim 10, further comprising:
- 2 an optical component arranged at least partially within said trench, said optical
- 3 component being adapted to propagate light between said first waveguide channel
- 4 portion and said second waveguide channel portion.

- 1 A method for forming an optical system, said method comprising:
- 2 providing a substrate;
- depositing on the substrate a first contoured channel preform of material
- 4 capable of ion exchange with the substrate; and
- 5 diffusing ions from the first channel preform into the substrate to form a first
- 6 waveguide charmel at least a portion of which is at least partially buried in the
- 7 substrate.
- 1 13. The method of claim 12, wherein diffusing ions from the first channel preform
- 2 into the substrate comprises:
- 3 providing antionic liquid;
- 4 immersing the substrate with the deposited first channel preform in the ionic
- 5 liquid such that a first portion of the ionic liquid engages the first channel preform and
- 6 a second portion of the ionic liquid engages the substrate; and
- 7 applying an electric potential across the first portion and the second portion of
- 8 the ionic liquid such that ions from the first channel preform diffuse into the substrate.
- 1 14. The method of claim 12, wherein in depositing the first channel preform, the
- 2 first channel preform is contoured with a varying width.
- 1 15. The method of claim 12 wherein in depositing the first channel preform, the
- 2 first channel preform is contoured with a varying height.



- 1 16. The method of claim 2, wherein in depositing the first channel preform, the
- 2 first channel preform is contoured with both a varying width and height; and
- wherein in diffusing lons from the first channel preform into the substrate, the
- 4 first waveguide channel at least partially buried in the substrate is formed as an
- 5 elongate, two-dimensionally tapered waveguide channel.

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- 17. The method of claim 12, wherein the step of providing a substrate comprises
- 2 providing a substrate comprising sodium cations; and
- wherein the step of providing an ionic liquid comprises providing a melt
- 4 comprising sodium nitrate
- 1 18. The method of claim 12, further comprising:
- 2 removing a portion of the first waveguide channel to form a trench, the trench
- 3 being configured to receive an optical element; and
- 4 arranging an optical element at least partially within the trench, the optical
- 5 element being configured to communicate optically with the first waveguide channel.

- 1 19. The method of claim 12, further comprising:
- 2 optically coupling an input transmission medium to the first waveguide
- 3 channel, the input transmission medium being configured to propagate light to the
- 4 first waveguide channel; and
- 5 optically coupling an output transmission medium to the first waveguide
- 6 channel, the output transmission medium being configured to propagate light from the
- 7 first waveguide channel.
 - 20. A waveguide component formed by the process of claim 12.
- 1 21. The method of claim 12, further comprising:
- depositing on the substrate a second contoured channel preform of material
- 3 capable of ion exchange with the substrate; and
- 4 diffusing ions from the second channel preform into the substrate to form a
- 5 second waveguide channel at least partially buried in the substrate.
- 1 22. The method of claim 21, further comprising:
- forming a trench along a light propagation path between the first waveguide
- 3 channel and the second waveguide channel, the trench being configured to receive an
- 4 optical element; and
- 5 arranging an optical element at least partially within the trench, the optical
- 6 element being configured to communicate optically with the first waveguide channel
- 7 and the second waveguide channel.